WETLANDS ARE NOT WASTELANDS

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wetlands are not wastelands report

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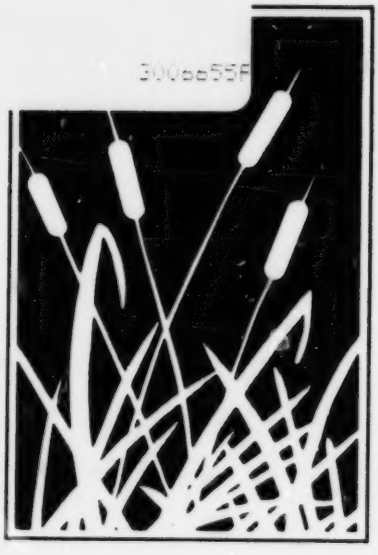

A JOINT PROJECT BETWEEN

WILDLIFE HABITAT CANADA

Environment Canada

WETLANDS ARE NOT WASTELANDS

SYNTHESIS OF PILOT STUDY RESULTS

December 1989

Report
6

Prepared for Sustainable Development Branch,
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PREFACE

The objective of the **Wetlands Are Not Wastelands** project is to develop and pilot test evaluation methodologies in order to identify current or new approaches which best show and incorporate the sustainable resource values of wetlands. Based on these activities a manual will be produced for use by provincial and local land-use planners and officials in the evaluation of wetlands and wetland change proposals.

Current methods of evaluating many resources inadequately portray their true environmental and economic value to society based on the functions they support. This is particularly true of wetlands, which, when threatened with conversion to other uses or with degradation, have been virtually impossible to adequately value using the most common current methods of evaluation such as benefit-cost analysis. As a result, many good wetlands have been altered to other uses simply because their value to society cannot be adequately demonstrated and because comparative evaluation methodologies automatically favour other short-term, high-value uses of the land resource.

There is, however, an increasing body of scientific literature identifying the importance of the functioning of wetlands in their natural state in providing for specific benefits to society. These functions include water storage, sediment retention and nutrient recycling, as well as the provision of increased biomass energy, biological diversity and fish and wildlife habitat. Likewise, there is a recognition of the value of these functions to society for wildlife and nature conservation, active and passive recreation, commercial plant and animal production, extraction, risk reduction, research and education, and asthetics or landscape diversity, among others, by various governmental and other agencies. This recognition in turn has prompted the development of conservation-oriented initiatives.

In response, this project has focussed on the development and testing of alternative procedures and evaluation methodologies which more adequately portray the true values of wetland resources. To do this, it is necessary to evaluate, adapt and develop methodologies, pilot test them on particular wetland problems, involve a wide spectrum of involved groups or individuals in the verification of the validity of such methodologies, and ultimately produce a manual backed by a broad consensus which can act as a guide to provincial and local land-use planners and decision-makers for appropriate evaluation of wetlands when they are involved in a planning decision process. The major steps in the project are listed below:

a) Based on a workshop focussing on alternative methods of evaluating renewable resources (Manning and Cox, 1986), a short list of potential approaches to the evaluation of wetlands has been developed. These include:

   1. an approach based on willingness-to-pay for wetland values and functions;

   2. an opportunity cost approach to be applied to measurable wetland values and to the proposed alternate use; and

.../2

3. a cumulative impact approach synthesizing a broader range of social goals and objectives than those generally encompassed by the term "economic".

b) The three alternative methodological approaches have been described in detail and the conceptual context of each is provided in the report "Wetland Evaluation: Methodology Development and Pilot Area Selection" (Bardecki, 1987).

c) The three selected methods have been tested in four pilot studies across Canada - the current stage of the project. The four case study areas are the Minudie Dykelands, Nova Scotia; the Greenock Swamp, Ontario; the Prairies Pothole region, Saskatchewan; and the Covichan Estuary, British Columbia. The sites were chosen to allow for testing of the applicability of the methods using a variety of types of wetlands.

d) Based on the results of the case studies a draft manual will be developed for application to the planning of the use of wetlands. It will include a discussion of the functions and values of wetlands, and the presentation of a range of approaches and methodologies appropriate to the evaluation of wetland values and their incorporation into the planning decision process. A workshop of experts in this field will evaluate the pilot study results and advise on the particular directions for the manual and its contents.

e) A conference of involved individuals from the planning community, wildlife community, agriculture, etc., will be held to engender broad based support for the manual as an appropriate method to be applied whenever wetlands use and management are in question. At a minimum, the manual should serve as a broadly based reference document for use by all decision-makers dealing with wetland conservation or conversion.

Wetlands Are Not Wastelands is a multi-year project being led by the Sustainable Development Branch, Canadian Wildlife Service and Wildlife Habitat Canada, with the assistance of CWS Regional Offices.

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INTRODUCTION

Historically, the conventional view of wetlands has been that these areas are unproductive and of minimal economic value. Any substantial benefits could only be realized through the conversion of the wetland to some other use. In Canada, as elsewhere, one result of this view has been the loss of a large proportion of the original wetland area.

The comprehensive valuation of wetlands for comparative purposes vis-a-vis other potential uses of these areas has been a particularly formidable task, especially with the most common current methods of evaluation such as those associated with benefit-cost analysis. Such methods have been shown to be of limited value in adequately embodying the entire extent of environmental and economic value of wetlands to society based on the wide range of functions these areas are capable of supporting. As a result, many beneficial wetlands have been converted to other uses simply because their worth cannot be sufficiently demonstrated and because comparative evaluation methodologies automatically favour the alternative -- short-term, high-value uses.

There is, however, an increasing body of research which has identified the importance of wetlands' functions in providing for specific benefits to society. Likewise, there is a recognition of the value of these functions to society by various governmental and other agencies. This recognition has prompted the development of a variety of conservation-oriented initiatives.

One initiative by Environment Canada and Wildlife Habitat Canada, the Wetlands Are Not Wastelands project, has been undertaken to develop and evaluate alternative procedures and evaluation methodologies which may more adequately portray the true values of wetland resources. Based on a workshop focusing on alternate methods of evaluating renewable resources (Manning and Cox, 1986), a short list of potential approaches to the evaluation of wetlands has been developed. These include:

* an approach based on willingness-to-pay for wetland values and functions,

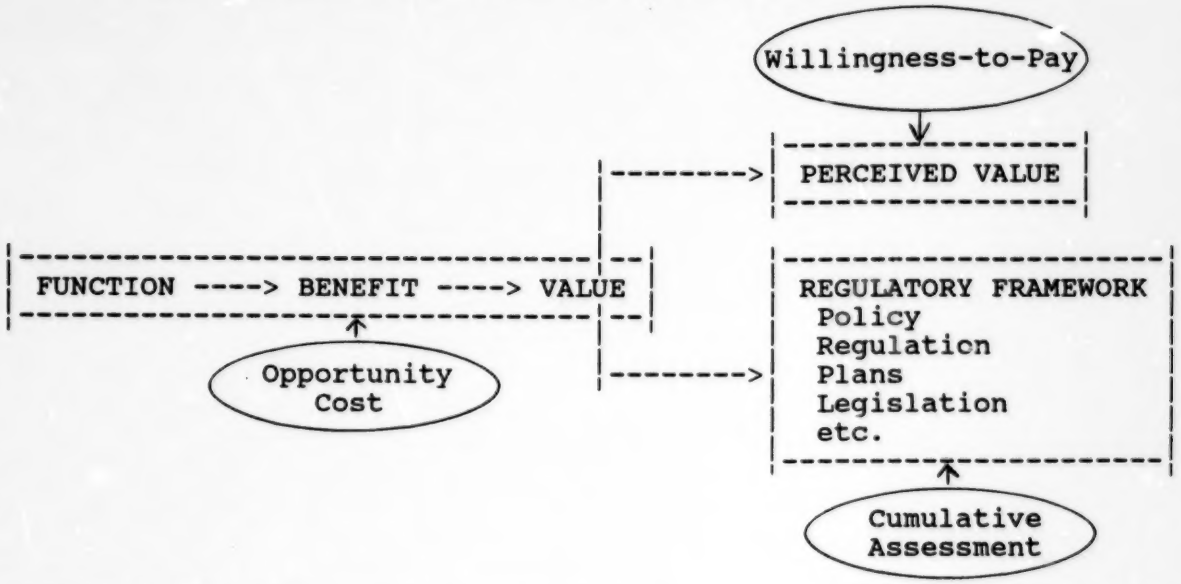
* an opportunity cost approach to be applied to measurable wetland values and to the proposed alternate use, and

* a cumulative assessment approach synthesizing a broader range of social goals and objectives than those generally encompassed by the term 'economic'.

The methods have been described elsewhere (Bond et al., 1988; Bardecki, et al., 1988) and have been developed into more specific procedures (Bardecki, 1987). Each method has the potential of revealing society's valuation of wetland areas, albeit indirectly (Figure 1). The willingness-to-pay method provides a measure of individuals' perceived value which, given a reasonable degree of knowledge and understanding, reflects the true worth of a wetland.

Figure 1

Schematic Diagram of the Relationship of the Alternative Methods of Evaluating Wetlands



The opportunity cost method is based on an analysis of the relationships which may be demonstrated among those wetland functions which are identifiable, the benefits which can be shown to depend upon them and the evaluation of those benefits by means of techniques of economic appraisal. The cumulative assessment approach incorporates the 'regulatory framework' (i.e., the entire range of existing policies, plans, regulations, legislation, etc.) as a manifestation of society's valuation of wetland areas.

The methods have been applied in three completed pilot studies: Greenock Swamp in Ontario (Bardecki, 1988), the Cowichan Estuary in British Columbia (Ferguson et al., 1989), and the Minudie Dykelands in Nova Scotia (Stokoe et al., 1989). In addition, a fourth pilot study is underway in the Prairie Pothole region (EMA Ltd., 1989).

This report has been undertaken in order to:

* summarize and integrate the methodological findings and conclusions from the pilot studies pertaining to the three methods;

* critically evaluate and analyze the scientific validity and practical applicability of the three methods based on the three completed pilot studies and the proposal for the fourth pilot study now underway; and

* provide a basis for discussion re the application of the three methods particularly in light of the fact that the development of a practical manual to be used to implement the methods in a planning context is anticipated. A series of 'key questions' has been incorporated into this report.

WILLINGNESS-TO-PAY APPROACH

The willingness-to-pay approach is a reasonably well established methodology (Mitchell and Carson, 1989). A more or less hypothetical (contingency) market is established for non-market goods or services. This normally involves reliance on the collection of data directly from individuals to assess personal estimates of their valuation (for example, of a wetland area). A study can be designed in a number of ways -- through personal interviews or phone or mailed questionnaires, with prior contact or without, focussing on the populace as a whole or on selected groups, etc. Ideally, the method has the ability to generate willingness-to-pay values for the entire range of wetland functions.

In response to the distinctive situations involved, the pilot studies employed (and will employ, in the case of the Prairie Pothole study) somewhat different methods in order to obtain willingness-to-pay values. The key points for each pilot study can be highlighted (Table 1).

General Strengths of the Method

The pilot studies which have been undertaken demonstrate certain general strengths of the willingness-to-pay approach. These include:

* At least for high profile wetlands it appears possible to obtain useful willingness-to-pay values from both local and non-local residents (Cowichan Estuary).

* Appropriate study design in the willingness-to-pay approach can address several problematic areas of the evaluation that plague other methods -- distinction between private and public benefits, the capacity to deal with the derivation of marginal values rather than average values alone, recognition of existence and option values, and the potential of precisely targeting the evaluation to specific wetland areas rather than the whole resource base.

* The approach is not without problems but the demonstrated success of the application of the method in general has been established. Evidence from several studies suggests that problems of bias are less than often anticipated (Bishop and Heberlein, 1979). Continued refinement of the design of questionnaires and the framework for willingness-to-pay may reduce problems to a minimum.

* The willingness-to-pay approach has the benefit of demonstrating not only economic interest but indirectly also may be taken as reflecting

Table 1

Key Features of The Pilot Studies
re Willingness-to-Pay

Greenock Swamp:

- willingness-to-pay elicited for the entire range of wetland values as perceived by the respondent, including option and existence values;
- assessed the "general public" (i.e., non-local residents), local residents and specific potential user groups (i.e., naturalists and snowmobilers);
- the telephone survey of non-local residents was based on a random telephone survey in a single large metropolitan area; for local residents a stratified random sample was chosen in nearby communities and contacted by telephone; data from potential user groups were collected by written questionnaire administered at scheduled meetings (snowmobilers) and by telephone survey (naturalists);
- willingness-to-pay of telephoned surveys elicited by "bidding" from an initial prompted value; that of written questionnaires by choice from among a range of options;
- N=110 with a response rate of 1.4 satisfactorily completed surveys per hour for telephone survey for non-local residents; N=52 with 1.7 satisfactorily completed surveys per hour for local residents; N=52 for potential user groups;
- willingness-to-pay considered separately from opportunity cost methods.

Prairie Pothole (proposal):

- focus of concern appears to be on values associated with the use of wetland areas;
- respondents to be identified by telephone survey from among the general public in the local area; possibly to include "special interest groups";
- N=200 proposed;
- willingness-to-pay to be incorporated into a benefit-cost framework.

Cowichan Estuary:

- focussed on the value of recreational uses (e.g. birding, hunting and sportfishing);
- assessed only local residents, with the exception of a survey of "the level of awareness or use" of the estuary in nearby urban areas;
- based on a random telephone survey;
- willingness-to-pay was elicited by an 'open' question incorporating a series of prices charged for other recreational activities (e.g., a round of golf costs $12.00);
- for respondents to the willingness-to-pay survey, N=194 with a response rate of 84.3 percent; for the less involved survey of urban residents, N=157 with a response rate of 94 percent;
- 95 percent of respondents indicated an awareness of the estuary, and 22 percent had made some use of the area in the preceding year; for the survey of urban residents the figures are 43 percent and 2.5 percent respectively;
- incorporated willingness-to-pay and opportunity cost within a benefit-cost framework.

Minudie Dykelands:

- willingness-to-pay elicited for the entire range of wetland values as perceived by the respondent, including option and existence values;
- assessed both the "general public" and specific potential user groups (i.e., sportsmen, naturalists and agriculturalists);
- the telephone survey was based on a stratified random sample in nearby communities; that of potential user groups by written questionnaire administered at scheduled meetings;
- willingness-to-pay of telephoned surveys elicited by "bidding" from an initial prompted value; that of written questionnaires by choice from among a range of options;
- N=79 with a response rate of 79 percent for telephone survey; N=80 for potential user groups;
- willingness-to-pay considered separately from opportunity cost methods.

political will, something which may go a long way to influencing decision-makers, whether or not more 'economic' measures can be derived.

General Weaknesses of the Method

A number of weaknesses in the use of the willingness-to-pay method were noted in the three pilot studies. These entail:

* A significant starting point bias in both cases was found where the "bidding" type format was employed (Greenock Swamp and Minudie Dykelands). The proposal for the Prairie Pothole study suggests that an aggregate demand curve may be derived by employing an alternate method involving questioning users about how their use of a resource would change according to various hypothetical charges or access fees. Results from this pilot study may illustrate how the problem of this bias might be lessened.

* There may be strategic bias in high profile cases where respondents may attempt to influence perceived planning or development decisions (Cowichan Estuary).

* There was an apparent difficulty in respondents distinguishing what was being sought in the willingness-to-pay (i.e., the value for wetlands in general, the value for regional expansion of wetlands, the marginal value of a portion of the wetland functions, the value of a particular site, or the value of the site versus other sites). More careful and unambiguous clarification of precisely what is being sought may help but it is suspected these problems will persist. As suggested in the Minudie Dykelands pilot study, perhaps a workshop setting might be more useful in allowing for fuller clarification, albeit at substantially increased investment of project resources.

* Response rates may be low (Greenock Swamp). The lack of response may be a result of several factors; in the case of Greenock Swamp including the fact that the issue of wetland conservation was not identified as immediate or central even to those living near the swamp.

* The cost of reaching a sufficiently representative sample appears high, especially when an attempt is made to incorporate the full range of wetland values and individuals, due to the potentially poor response rates and dispersed populations. The sampling frame employed needs reflect the different geographic and potentially different demographic characteristics of those possessing a willingness to pay for a given wetland area.

Applicability of the Method

Concerning the method's applicability, it appears that those with some sense of involvement and knowledge are most likely to participate in a worthwhile manner and provide useful responses. This brings into

question how to best create a sampling frame for determining willingness-to-pay. It is clear from the pilot studies that the method is most successful when garnering responses from users and for the evaluation of specific on-site uses.

In terms of general success in obtaining functional responses, it appears that there is a hierarchy of utility among the various groups which may be targeted in a willingness-to-pay survey, namely:

user groups > local residents > non-local residents within 'benefit-shed' > others.

Understandably, members of organized user groups appear to provide the most dependable responses. They, as a body, are also reasonably easily identified and contacted.

Local residents, who presumably have an opportunity to recognize the wetlands' values and may have some perceived self-interest (and a high proportion may be users of the wetland) are also readily surveyed with modest investment in resources given the limited geographical scope necessary and the potential for dependable response rates.

Individuals who do not live in the local area but who may benefit from the wetland (e.g., people travelling some distance to the wetland for hunting or other recreational pursuits) are a more dispersed population. As a result, a greater investment in resources is necessary to obtain results.

The fourth group, 'others', provides the greatest challenges, and, as perceived by some of the pilot studies, the least rewards. The population without direct involvement in the specific wetland is, however, limited to considering the more unexplicit 'existence' (and 'option') values (the 'preservation' values in the Cowichan Estuary report). Such less tangible values are clearly more difficult to elicit and more difficult for individuals to express. Nonetheless, they may be considerable.

Targeting the method solely to the groups with the greatest direct involvement (e.g., users or special interest groups) would provide the best responses and certainly would be the most cost-effective means of collecting information. The difficulty with this is that these groups of 'involved' individuals may represent but a small proportion of the total willingness-to-pay and such data would not fully reflect the entire societal value. The procedure would be less consumptive of study resources but would fail in large part to capture external (e.g., recreational fisheries dependant on wetlands but not in wetlands) and other societal (e.g., existence) values.

In a sense, even when attempting to evaluate a highly significant wetland area which is of public concern, a dilemma still exists in that efficiencies of time and cost work against a comprehensive evaluation.

However, perhaps the levels of awareness concerning wetlands of the general populace are so low that any attempt to obtain a reasonable measure of willingness-to-pay is fruitless.

It may be that the most appropriate application of the willingness-to-pay method is where a significant alienation affecting a well recognized wetland area has received public attention. Certainly, a quick reconnaissance survey involving a simple questionnaire and a short period of interviewing can reveal the extent of interest, involvement and commitment of individuals to expressing a willingness-to-pay for wetlands. This may be generally instructive even if specific results pertaining to willingness-to-pay are of limited value. Conceivably, it is in such cases where the political response to the results may be most sensitive.

In certain circumstances, the willingness-to-pay method may be the only viable alternative to evaluate wetland value. This is particularly the case where there is no dominant large wetland but rather a complex of smaller areas. To differentiate and hence evaluate a single wetland which may be alienated in such an area, other methods such as opportunity cost with its reliance on available site-specific information, may be difficult to apply.

Data and Expertise Needed

The basic tool of the willingness-to-pay method is the survey instrument. Some theoretical and methodological problems have not been resolved.

Four different formats to eliciting willingness-to-pay are involved in the pilot studies: a 'prompting' approach with iterative bids (Greenock Swamp and Minudie Dykelands phone interviews), choice from a scale of possible values (Greenock Swamp and Minudie Dykelands written responses), an 'open' approach which provided price comparisons with other activities (Cowichan Estuary), derivation of an aggregate demand curve (Prairie Pothole proposal). It is not clear which is most appropriate. The prompting approach is widely and successfully used by the U.S. Forest Service in their valuation of a variety of outdoor recreational activities but does have problems, especially of starting point bias. The method of picking from a limited range of choices is likewise subject to bias, but is readily applied if an interview format is not feasible. The other methods have a stronger theoretical and conceptual basis, but do have limitations. Both lend themselves to situations of evaluation values associated with consumption or use. In the case of the method involving an aggregate demand curve there is an assumption that the respondent has a reasonably sophisticated degree of understanding; this may be the case at best only for a limited range of wetland values.

The concern remains, "Is willingness-to-pay only a limited tool for assessing a restricted range of wetland benefits (e.g., recreation) and therefore best used as one element in a traditional benefit-cost

approach (as is suggested in the Cowichan Estuary study and the Prairie Pothole proposal)? Or can it capture the full complement of wetland values alone; values which may not be discerned otherwise (as was the goal of the Greenock Swamp study)?" The issue has a fundamental impact on the method; for example, the approach of asking, "How much would you buy at a certain price", as is the case for the Prairie Pothole proposal, is readily applied only for values derived from consumption or use. This is a central issue since it is acknowledged that a high proportion of wetland values are externalities and are not readily priced. For some of these values the suggestion in the Minudie Dykelands study of developing and extending the methods Hammack and Brown (1974) used for developing economic values for waterfowl could be explored.

A further question remains of the appropriate form for the derivation of people's estimate of worth -- willingness-to-pay or willingness-to-accept compensation. In a review of the literature Knetsch (1988) found willingness-to-accept values to be 2.6 to 16.5 times greater than willingness-to-pay.

In a least two of the pilot studies (Greenock Swamp and Minudie Dykelands) respondents had difficulty in dealing with a hypothetical or a speculative situation in estimating willingness-to-pay. Such observations support the use of focus group or similar types of approaches (McNeely, 1988) for more elaborate scenario building. Serious consideration may be given to using more innovative techniques to generate values (e.g., Randall et al., 1974; Sinden and Windsor, 1981). A trial of these may be warranted.

There are as yet unresolved issues about the specific structuring of the survey instrument. For example, as suggested by the Prairie Pothole proposal, is the issue of whether the interview should focus on the individual or household since extrapolation of data and interpretation of results differ.

Key Questions

* In general there is a question concerning the cost effectiveness of willingness-to-pay, especially in comparison to other means. Results appear to be mixed with the greatest successes being found when the scope of willingness-to-pay was significantly circumscribed only to values associated with consumption and active use of the wetland resources.

* Given that the most successful application of the willingness-to-pay was in the most publicly conspicuous and controversial case (Cowichan Estuary) should the method be limited in application to similar circumstances?

* Should, or can, the willingness-to-pay instrument be standardized, thereby resolving issues of willingness-to-pay versus willingness-to-accept compensation, the choice of question format, value scope, etc.?

Is there a need to consider the role for alternate survey methodologies (e.g., involving telephone vs face-to-face interviews)? Or to assess indirect means for estimating willingness-to-pay such as the travel cost method (Walsh, 1986)?

* There is evidence that the numbers of respondents involved in the pilot studies may to be too small to provide statistically robust results (Greenock Swamp, Cowichan Estuary); yet this level of response has involved a considerable investment of resources. To what extent can the trade-offs involved in increasing inputs be balanced against more satisfactory results?

* How does one deal with non-respondents in the assessment of value? It is clear that different interpretations of the impact of non-response greatly affects the results (Cowichan Estuary). This is compounded by the fact that their numbers may be considerable.

* Is there a role for an assessment of property (hedonic) values as a measure of willingness-to-pay? It can be anticipated that property prices do not fully incorporate all wetland values, but given the limited scope of success in questionnaires capturing all values, can this be accommodated? This avenue has not been fully explored.

* Similarly, is there a role for focus groups, or similar approaches, for assessing willingness-to-pay?

* The Prairie Pothole proposal suggests that past experience of the surveyors is a significant factor in generating high response rates. Given the potential arena for using these methods, is it reasonable to question the balance between expert vs non-experienced interviewers? And to reflect on the degree of expertise which will be available at the local planning level.

* Consideration has to be given to the possible incorporation of an evaluation of willingness-to-pay concerning wetlands' conservation/preservation at a national level in order to acquire a sense of the broad willingness to pay for such undertakings and to establish a total valuation of wetlands.

OPPORTUNITY COST APPROACH

In general terms, the opportunity cost of conserving a wetland area is the net monetary benefit which may be derived from the best alternative use of the area which must be foregone to preserve the area in a natural state. Similarly, should a wetland be converted to an alternate use, it is possible to assess the opportunity cost associated with the decision. In this case, the values derived from the wetland in its unaltered state which are lost through conversion represent the opportunity cost of that conversion (Shabman, 1986).

The basis of evaluating the opportunity costs of development is the derivation of monetary values for the entire range of benefits derived from a wetland. Therefore, the initial concern in applying the method is in ascertaining the presence of any given function providing social benefit. In some cases simple inventory techniques and observation can confirm a wetland's value (e.g., through surveys of hunting or biological inventories of endangered species). In other circumstances such data are fugitive or may not be feasible to obtain for monetary, time or technical reasons. Generally, limited data are available concerning the value of many benefits generated by an individual wetland's functions. Nonetheless, several prior studies have illustrated means by which to perform the economic analyses of wetland values (e.g., Gosselink et al., 1974; Mumphrey et al., 1978; Raphael and Jaworski, 1979; Thibodeau, 1981; Costanza and Farber, 1985; Van Vuuren and Roy, 1989).

As with the willingness-to-pay studies the pilot projects differ in their application of the principles of opportunity cost evaluation. The key elements of each pilot study are indicated in Table 2.

General Strengths of the Method

The opportunity cost method lies within the realm of conventional economic analysis. Many of the benefits attributable to it derive from the substantial theoretical and methodological underpinning which has been established for the approach:

* being part of orthodox economics implies a significant degree of acceptance for the approach and for the results;

* moreover, since the method incorporates generally well understood concepts, the results may well be better grasped and thereby incorporated into pragmatic decision-making;

* the diversity of methods which have been developed potentially allow the incorporation of a diverse range of evaluation techniques, one or another of which may be appropriate to evaluate each of the broad range of benefits based on a wetland's functions;

* one may use data from site-specific surveys which are already in existence. For example, biological surveys, creel censuses, forestry inventories, water quality measurements and historical stream flow records all provide the potential for asserting or imputing certain functions;

* even if such data are unavailable, one may apply more general evaluation methods. Techniques such as that of Adamus et al. (1987) provide a certain valuable perspective on a wetland's functioning. The Adamus et al. method is a practical means for assessing wetland areas' functions and provides a means for extending analyses beyond that obtainable from detailed site-specific studies. Indeed, even in the total absence of clear site-specific data concerning a wetland's

Table 2

General Feature of the Pilot Studies
re Opportunity Cost Method

Greenock Swamp:

* case involves a large forested swamp potentially affected by marginal agricultural encroachment and forestry;
* incorporates WET (Adamus et al., 1987) to identify the presence of specific wetland functions;
* monetary evaluation incorporates forestry production, fur harvest and floodflow alteration, as well as a consideration of property prices;
* difficulties are specifically noted in valuing wildlife, recreation and 'regional scarcity' values.

Cowichan Estuary:

* case involves an estuarine wetland complex potentially affected by port facility expansion and agricultural development;
* specific wetland functions are identified through secondary sources;
* wetland functions for different habitat types are interpreted by means of judgmental 'capability' and 'scarcity' ratings;
* through the use of the 'capability' and 'scarcity' values, a measure of the marginal impacts of proposed developments is derived;
* monetary evaluation incorporates recreation (incorporating willingness-to-pay data) and commercial fishing values, as well as a consideration of property values;
* ecological, and research and education values are noted but not valued; water quality values are deemed to be reflected in recreation and commercial fishing values.

Minudie Dykelands:

* case involves the potential conversion of a current agricultural area to a freshwater wetland;
* incorporates WET (Adamus et al., 1987) to identify the presence of specific wetland functions;
* method based on a limited application of the procedures of Gupta and Foster (1975) which had been developed for wetland areas in Massachusetts;
* monetary valuation of the wetland area basically incorporates wildlife values alone; there is a detailed evaluation of the current agricultural use of the area;
* difficulties are specifically noted in valuing visual-cultural benefits.

Prairie Pothole (proposal):

* case involves wetland areas potentially affected by agricultural activities;
* to be based in part on an evaluation of waterfowl habitat and population data;
* monetary evaluation of a wide range of wetland functions to be undertaken; the focus appears to be recreational uses.

functioning, the Adamus et al. methods can result in a useful assessment of functions;

* unlike the willingness-to-pay technique, it is possible to focus on the evaluation of individual wetland functions thereby highlighting key functions. The impacts on these may be amenable to mitigation;

* the methods make it possible to incorporate a consideration of future changes in value into the current situation;

* the opportunity costs associated with a wetland may be particularly useful in the comparative evaluation of a large capital undertaking. Only the incremental benefit accruing to locating the project on the specific site might need to be calculated; and

* even partial results may still provide an impetus for the consideration of a wider range of factors than otherwise would be considered.

General Weaknesses of the Method

Above and beyond the general criticisms which have been leveled at an 'economic' approach to evaluation (e.g., Self, 1975; Manning, 1987), in applying the opportunity cost approach the first recognition needs be that wetland functions are diverse and complex. One of the main difficulties in assigning monetary values to wetlands is that there exists no consensus on the nature of, nor is there sufficient research concerning, the beneficial aspects of wetlands which are derived from these functions. The comprehensive evaluation of the opportunity costs associated with wetland conservation, or of the conversion of wetland areas to alternate uses, is not possible. Any evaluation of site specific benefits would entail a detailed evaluation of the entire biological and hydrological functioning of the wetland area. Only certain portions of the analysis can be realistically completed with any sense of reliability or rigour. The opportunity cost approach, as with any conventional economic analysis, cannot be exhaustive for a number of reasons:

* there is a general imperfection in the understanding of wetland functions;

* data necessary to evaluate wetlands are not routinely collected and/or involve extraordinary commitment of time, money and expertise;

* the majority of wetland values are not directly priced and shadow prices cannot be derived without a loss in cogency;

* evaluation of the opportunity costs associated with wetland values is limited since certain values are not fully reproducible;

* wetland values are not always provided on-site or through traceable links:

* it may be possible to attribute certain values to wetlands in general (e.g. support of fisheries through the provision of nursery habitat) and calculate average values, but it is often not possible to provide methods for deriving marginal values attributable to individual wetlands. Unfortunately, methods permitting the assessment of the marginal values for wetland resources are not available (Lynne et al., 1981) and data reflecting the conditions at the economic margin normally do not exist. The Cowichan Estuary study provides a potential mechanism for roughly assessing marginal impacts by generating ratings for each habitat type based on estimating the relative capability and relative scarcity of wetland types. The study does acknowledge the problems with this approach; and

* property prices imperfectly reflect resource value.

Applicability of the Method

As is indicated by the focus of Cowichan Estuary study and the Prairie Pothole proposal on the opportunity cost method as the hub for their evaluation, the method has the broadest application, in no small part due to its basis in orthodox economics and the range of techniques available.

The opportunity cost method provides significant insight into certain aspects of a wetland's value but the method may not be fully comprehensive since data are often lacking, wetland functions are usually imperfectly known and there is frequently difficulty in assessing shadow prices. The foundation for the identification of specific benefits may have to be based at worst on speculation, conjecture and assumption, at best on expert judgement.

Assessing the impact of any proposed alienation on a wetland's functioning provides an additional level of complexity. Obviously, the more refined the project's character, the better for the application of the opportunity cost approach. A literature search can provide general insights into the nature of potential impacts, however, specifics need be developed particularly considering the range of potential alienations. A variety of methods developed for environmental impact assessment needs may be appropriate (e.g., the matrix developed in the Cowichan Estuary report).

The priorization method employed in the Cowichan Estuary pilot study (i.e., of generating ratings for each habitat type based on assessing the relative capability and relative scarcity of wetland types) may be particularly useful for situations involving the marginal loss of a variety of habitat types.

In summary, although there are difficulties in the application of this methodology where wetlands are ubiquitous and where the need to relocate or replace is not clear, this approach may be quite amenable to specific capital projects. Additionally, the opportunity cost method could be responsive to the needs of the standard of no-net-loss of wetland area

and function should that principle be adopted as policy. Although the work necessary to generate information to feed this analysis may prove onerous, the approach may be particularly useful in the comparative evaluation of locating an undertaking in a wetland area versus an alternate site. In this case, only the incremental benefit accruing to locating the project on the specific site needs to be calculated. Generally speaking, the complexity and expense of the opportunity cost approach suggests that decision-makers could employ it usefully only in a comparative site evaluation for a major capital project. A comprehensive analysis may
be difficult, but even partial results may provide a rationale for the consideration of a wider range of factors than otherwise would be taken into account.

Data and Expertise Needed

The opportunity cost method is the most demanding in terms of data and expertise. How can these needs be accommodated within the context of local decision-making involving wetland areas? One tendency would be to ignore certain values which are difficult to address or price.

Certain refinements of the method (e.g., assessing benefit and value streams into the future as suggested by the Minudie Dykelands report and the Prairie Pothole proposal) would add to the demands. Certainly the complexities of dealing with these issues need be addressed if the comprehensive evaluation of current situation is resolved but they need be accommodated within the planning milieu for which the methods are designed.

Key Questions

* By what means can the presence of specific functions and benefits for a given wetland be verified? Techniques are available (e.g., WET evaluation system, Greenock Swamp and Minudie Dykelands; indicator species using HEP, Prairie Pothole proposal; secondary sources and expert judgement, Cowichan Estuary). What is their role? How can the magnitude of the functions be established?

* Are means available (perhaps from the practice of environmental impact assessment) for predicting the impact of an alienation on those functions and assessing the undertaking's viability?

* Do guidelines have to be set for the procedure (e.g., establishing a common discount rate and time horizon). What guidelines are appropriate?

* How might intangible and unpriced variables be accommodated within the framework of opportunity cost? Methods employed in the pilot studies appear to be able to accommodate the valuation of certain benefits associated with wetlands (e.g., marketable products, recreation); the assessment of others has not been addressed as yet (e.g., education,

visual-cultural values). These could be of paramount importance for certain wetland areas.

* The values imputed to the three wetlands vary over three orders of magnitude (Cowichan Estuary wetlands being valued at $114,000/ha; Greenock Swamp at $215/ha). Although there are substantial differences in the actual benefits attributable to these wetlands (particularly since important recreation and commercial activities depend upon the Cowichan Estuary), does this difference to some extent reflect methodology? How can differences such as this, in particular considering that these wetlands are already recognized as worthy of conservation efforts, be resolved within a framework for a national scheme of evaluation?

* To what extent do the data and expertise needs of the opportunity cost method limit the practical application of the method for local planning?

* The Cowichan Estuary study poses the issue of the difficulty in attributing all the value of certain benefits to a wetland when the value may also be dependent upon conditions and processes elsewhere. Is this a valid concern? Can it be addressed?

* Do threshold standards have to be set for minimum inclusion of factors for consideration?

* Perhaps the most obvious summation of value is that suggested by property prices. However, given a number of problems, including the considerable variation in price from parcel to parcel, which make extrapolation of these to the valuation of an entire wetland difficult, is there a role for hedonic evaluation within the framework of opportunity cost?

* Do available methods (including that of the Cowichan Estuary study) adequately address the needs in the method for an analysis of marginal values associated with incremental and cumulative impacts?

CUMULATIVE ASSESSMENT APPROACH

The method involved in a cumulative impact approach entails evaluating a particular resource alienation proposal against a series of specific standards or benchmarks reflecting the range of applicable societal goals and objectives. Many such goals and objectives are associated with or are served by wetlands. The approach suggested involves the evaluation of proposed alterations to the environment in light of these. This necessitates the identification of which social values are served by the functioning of wetland areas, and, of these, which are threatened by a development proposal.

A set of criteria, both quantitative (for example, recognized water quality standards) and qualitative (for example, general objectives related to conservation of habitat diversity) are to be identified from existing legislated and stated governmental goals and objectives, as well as from scientific principles. Projects failing to satisfy one or more of these standards may be evaluated in light of their impact on the range of identified societal values. Three factors may be considered to denote the importance of any criterion:

* the centrality of the objective within the regulatory framework (i.e., certain objectives, for example, that of fiscal responsibility, may play a prominent role in decisions; others less so);

* the relative strength of the basis upon which the objective is founded (e.g., legislated objectives generally may be considered more sound than policies, policies more so than guidelines). The more clearly defined these objectives become (e.g., through formal designation of specific endangered species' habitat, or through the adoption of quantitative particulate concentrations in water), the more readily these can be utilized in decisions affecting a proposal;

* the degree of 'scientific' evidence clearly linking any impact to a proposal.

The cumulative impact approach relies on already established criteria, particularly those legislated or established in some accepted form as objectives for the communities or regions involved, but also including scientifically-based criteria relating to valued wetland functions and benefits. The principal problem in the application of the approach is the identification of these objectives in a manner which can be adequately applied in the field to actual wetland alienation decisions. The approach focuses on the identification of a set of standards relative to which any proposed alienation or alteration can be evaluated. Because several different criteria may be used to evaluate alienations, the decision-maker is faced with a visible accounting of the cost of any given action through the explicit identification of which social values may be jeopardized by the proposal.

As a general summary of the three completed pilot studies, one may indicate for the individual objectives provided in Bond et al. (1988) the manner in which particular pilot studies address each (Table 3).

General Strengths of the Method

The cumulative assessment method is the least 'conventional' of the assessment procedures. Nonetheless, it does provide certain advantages when compared to the alternatives:

* the method is promising in that it provides the basis for incorporating the range of existing social goals and objectives associated with the protection of priority wetlands not simply those associated with economic evaluation;

Table 3

General Features of the Pilot Studies re Cumulative Assessment Method

	Degree of Consideration of Criterion	Source of Objective
1. Viability of the Proposed Activity: Is the proposed activity one which is economically viable to the proponent (without subsidy)?		
• Greenock Swamp:	focussed discussion	provincial legislation in general
• Cowichan Estuary:	focussed discussion	no discussion
• Minudie Dykelands:	focussed discussion	no discussion
2. Site Alternatives: Is there an alternative site or sites where the proposed activities can be placed where the same or comparable benefits to the proponent can be obtained?		
• Greenock Swamp:	focussed discussion	none
• Cowichan Estuary:	focussed discussion	federal guidelines?
• Minudie Dykelands:	focussed discussion	none
3. Water Quality: Does the proposed alteration to the wetland enhance or reduce water quality in the wetland itself, in a related groundwater system, in the watershed in general, or in a domestic or other water source?		
• Greenock Swamp:	focussed discussion	provincial guidelines
• Cowichan Estuary:	focussed discussion	provincial criteria
• Minudie Dykelands:	focussed discussion	none

cont.

Table 3 cont.

4. Toxics: Does the proposal add toxic input to the wetland or reduce the wetland's role in the retention of toxins?		
• Greenock Swamp:	focussed discussion	provincial guidelines
• Cowichan Estuary:	no discussion	no discussion
• Minudie Dykelands:	focussed discussion	none
5. Water Quantity Management: Does the proposal affect flood storage capacity? aquifer recharge?		
• Greenock Swamp:	focussed discussion	provincial guidelines and regulations
• Cowichan Estuary:	no discussion	no discussion
• Minudie Dykelands:	n.a.	
6. Habitat Quality: Does the proposed project have an adverse impact on habitat quality?		
• Greenock Swamp:	focussed discussion	provincial guidelines, local by-laws
• Cowichan Estuary:	focussed discussion	no discussion
• Minudie Dykelands:	focussed discussion	federal initiatives, provincial policy and NGO interest
7. Wildlife: Does the proposal increase or decrease wildlife populations?		
• Greenock Swamp:	focussed discussion	none
• Cowichan Estuary:	focussed discussion	no discussion
• Minudie Dykelands:	focussed discussion	general application of provincial Act
8. Endangered Species: Is the wetland habitat for endangered species?		
• Greenock Swamp:	focussed discussion	provincial legislation
• Cowichan Estuary:	no discussion	no discussion
• Minudie Dykelands:	n.a.	

cont.

Table 3 cont.

9. Wildlife Utilization: Do consumptive or non-consumptive uses of wildlife exist?		
* Greenock Swamp:	focussed discussion	provincial guidelines
* Cowichan Estuary:	discussion	expenditures for conservation projects
* Minudie Dykelands:	focussed discussion	provincial policy, local government, NGO and public interest
10. Recreation: Does the proposed alteration increase or decrease the quantity and the quality of recreational opportunities associated with the wetland?		
* Greenock Swamp:	focussed discussion	provincial guidelines
* Cowichan Estuary:	focussed discussion	no discussion
* Minudie Dykelands:	focussed discussion	provincial policy, local government, NGO and public interest
11. Economic Production: Does the proposed alteration reduce the economic potential of the production base of the wetland?		
* Greenock Swamp:	focussed discussion	provincial guidelines and agreements
* Cowichan Estuary:	discussion	no discussion
* Minudie Dykelands:	focussed discussion	none
12. Education and Scientific: Does the area contribute to education and scientific pursuits?		
* Greenock Swamp:	focussed discussion	none
* Cowichan Estuary:	focussed discussion	federal/provincial program designation
* Minudie Dykelands:	focussed discussion	none

cont.

Table 3 cont.

13. Uniqueness: Is the wetland a unique or representative ecosystem?		
* Greenock Swamp:	focussed discussion	provincial policy, guidelines and general designation; local by-laws
* Cowichan Estuary:	no discussion	no discussion
* Minudie Dykelands:	focussed discussion	none
14. Regional Scarcity: Are there quantitative thresholds established for wetlands of for specific types of wetlands within the region and does the proposed alteration influence the achievement of them?		
* Greenock Swamp:	focussed discussion	provincial policy, guidelines and general designation
* Cowichan Estuary:	focussed discussion	none
* Minudie Dykelands:	focussed discussion	general federal and provincial policies

Note: n.a. not applicable (as noted in report)
no discussion criterion is not discussed in report
discussion a limited discussion of the criterion is provided
focussed discussion the criterion is discussed specifically in reference to the method

* it is broad, potentially encompassing the entire range of functions and benefits derived from wetlands -- at least those which have been recognized in some formal manner through government policy, regulation, etc. or those criteria emanating from research initiatives;

* given that the method is derived in part from government policy, regulation, etc., the method obviously reflects the political will, and in doing so supports the conventional decision-making process in the political arena;

* the method potentially incorporates scientific evidence (e.g., concerning the threshold level of wetlands in a watershed for optimal downstream benefits);

* the method may be part of an evolutionary, consultative, negotiated process, responding to changes in policy and knowledge (i.e., it is 'planning');

* individual objectives within the method are as explicit as the original policy, regulation, etc. from which they are derived;

* the method may be readily adopted in practical situations as it operates within the regulatory environment with which planners are already familiar;

* it has the advantage of unshrouding the decisions as those involved are forced publicly to weigh the violation of certain criteria against the benefits to be derived from a proposal involving the alienation of a wetland area. The method is designed to pinpoint clearly those trade-offs inherent in land use decisions affecting wetlands;

* it is suggested that the continued application of approaches such as these ultimately will identify the gaps in current legislation and policy, and science, which can be addressed in order to supply the comprehensive basis for a rational consideration of all decisions involving the potential for the alienation of wetland values;

* much of the fundamental work is not site specific but rather relates to general government policy and scientific work which might be applied universally at least within a region;

* the method has potential value as an initial screening process whereby the significance of a given wetland may be assesses vis-a-vis existing criteria. In certain cases, given clear criteria, the impacts of development proposals may be effectively appraised on this basis alone.

General Weaknesses of the Method

Despite the advantages of the cumulative assessment method, there are substantial impediments to its application, for example:

* the successful application of the method to any given wetland alienation will depend on how many of the criteria have already been established in the planning process at national, provincial, regional or local levels and how well these criteria can be ascribed to a specific proposal;

* few specific (or quantifiable) objectives may be identifiable. Even for these, data limitations may restrict their value;

* many objectives, as noted particularly in the Minudie Dykelands and Greenock Swamp studies, are voiced in most general terms. Application of these to specific situations may be not be feasible;

* a number of policies, regulations, guidelines, etc. all may play some role in assessing the merits of a specific undertaking (e.g., Table 3 illustrates that in each case study a number of criteria may come into play, each with its own basis in legislation, policy, regulation, etc.). However, it is difficult to evaluate the operational character of many of these. Under what circumstances are they invoked? How closely are they followed? What are the relative strengths of conflicting objectives in resolving issues? Answers to these types of questions are not readily identifiable without a considerable background in cases to evaluate and, even then, the individual circumstances would vary widely;

* in most cases it is anticipated that no clear justification based on an individual criterion would be available and the ultimate decision would be made based in some manner by evaluating the number and importance of those criteria which are not satisfied by the proposed alienation. As noted in the Minudie Dykelands report, how does one draw results? What does it mean when there is no compelling result from considering any single criterion? By what means can a composite evaluation of a development proposal's impacts be derived?

Applicability of the Method

For each objective for which wetlands may contribute, appropriate measures as defined by pre-existing criteria need to be identified. The success of the application of the method lies in its direct derivation from accepted sources such as regional plans, conservation strategies, sectorally established goals, official designations, scientific evidence, etc. Many criteria ideally would take the form of quantitative thresholds. For example, a stated goal in a regional plan that the total area of wetland should not fall below 7 percent of the region's total area, or specific indicators of water quality, toxin levels, or other such officially accepted measures which may be related to a specific proposal provide a ready means for assessing the proposal.

At the outset, the development and support of a cumulative impact approach will require the commitment of significant resources both to identify applicable standards and for data collection and analysis with

regard to individual wetlands of concern. Much of this work may be applicable at least on a regional level. Despite anticipated logistic difficulties, the potential advantage of the approach is that it can provide decision-makers with an interpretation of the full range of implications of specific undertakings and an interpretation of the extent to which specific wetland values are imperiled by a development proposal.

It is apparent from the Greenock Swamp and Minudie Dykelands investigations, that the key to identifying significant criteria is their site-specificity. General guidelines and policies generally provide only the broadest perspectives and direct application of these to specific alienation proposals is difficult. This appears to be the major impediment to the method.

As suggested in Bond et al. (1988) the optimal use of the cumulative assessment method may be as a initial scanning approach.

Data and Expertise Needed

The cumulative assessment technique is likely the least demanding in terms of necessary expertise and of the specific data requirements relative to individual wetlands. Moreover, much of the research needed for one wetland site could be applied broadly.

The expertise needed is, in comparison to the other methods, less specialized and it is likely that most planning offices already have access to much of the necessary data for establishing objectives and criteria. It is in the application of these to specific wetland sites and in explicitly interpreting the potential impacts of development proposals on particular wetland functions, that difficulties may arise.

Key Questions

* To what degree is the cumulative assessment approach cost effective in achieving a useful assessment of wetland values?

* Are there practical means to deal with variety of objectives which may need be integrated in the procedure? Is there a role for a specific technique to consolidate the multiplicity of objectives in a systematic manner?

* Is there a need to establish a means for developing a hierarchy of objectives in order to clarify their individual significance?

* How might it be possible to overcome general nature of objectives as expressed in existing policies, plans, etc.?

* Given the rather broad application of many policies, plans and programs affecting wetlands as well as the potentially ubiquitous application of many scientific principles, might it be useful to

provide a standardized guide to existing objectives even at a regional level?

* What is the extent of practical application of the method? Is the approach basically to be used as a screening process prior to more intensive economic appraisals of wetland's values?

* To what degree does the approach fit within the standard practices of planning? Is it possible to modify it in some manner to make it more satisfactory?

* Is there a role for a 'multiple accounts' framework (e.g., a habitat account, a biological account, a socio-economic account) each with its own evaluation criteria, as suggested in the Cowichan Estuary study? This approach may well provide a systematic structure for the consideration of the diversity of objectives which may potentially have to be considered.

* Might a better name be found for the approach? There is an obvious confusion over the name. It appears that the term 'cumulative assessment' (and the earlier 'cumulative impact') have at times been used interchangeably with 'cumulative impact assessment', a process and associated series of techniques which are part of 'environmental impact assessment'. The procedure involves three components. It is established on a series of **criteria**, which in turn are based on **objectives** derived from legislation, policies, guidelines, etc. Since potentially no one criterion may be sufficient in and of itself, the method involves the scrutiny of the **cumulative (aggregate)** consideration of all criteria. Any name for the method likely should incorporate the three key concepts.

INTEGRATION OF THE METHODS

The Minudie Dykelands report concluded:

> One aspect ... in this case that was very useful, if not indispensible, for obtaining results in the time that was available was the convening early in the project of a workshop with about 25 participants ... who were particularly knowledgeable about the study area ....

Given the anticipated level of expertise of those by whom the methods may be employed, the generally disparate expertise needed for a full understanding of the situation, and the often limited time constraints available for review, the workshop concept may be a valuable means of focussing and directing the appraisal procedures.

The three approaches tap different data sources and provide different perspectives on the significance of specific wetland values. Given this, can there be a reasonable integration of the three approaches into one sequential approach? As mentioned above, cumulative assessment

might provide a means of initial scoping by identifying areas of concern or potential conflict. It appears that in the majority of situations it would not provide conclusive support for an evaluation of a wetland's worth given that it depends on policies and criteria which are crudely defined if at all.

The evaluation process might then be viewed as a triage. Certain proposed projects with potential impacts on wetland areas may be identified as unacceptable for reasons of internal economic non-viability or due to the acceptability of alternate non-wetland sites or for other reasons identified through application of the cumulative assessment approach. Those projects with minimal potential for adverse impacts could be accepted (with appropriate mitigation). Finally, certain projects, would remain in the gray area, perhaps necessitating detailed investigation; the other methods of evaluation (i.e., willingness-to-pay, opportunity cost, or, perhaps, a more intensive cumulative assessment) would come into play here.

Another integrative approach is suggested in the pilot studies. The Prairie Pothole proposal (and, to a lesser extent, the Cowichan Estuary study) promote the idea that the three approaches, willingness-to-pay, opportunity cost and cumulative assessment, may be best integrated into an overall evaluation framework based on benefit-cost analysis. It is suggested that, "the concept of opportunity cost would be employed to evaluate those wetland functions where market-derived prices are unavailable, and willingness-to-pay techniques would be used to evaluate specific wetland functions like recreational uses."

In addition to the planned development of a manual for the implementation of the evaluation methods, a further means of integrating the process might be through the development of an 'expert system' or decision tree approach as noted in the Minudie Dykelands report, this would provide specific benefits:

* recommendations to users about appropriate utilization of the methods;

* a product perhaps "more congenial to use" than a text manual;

* a product which would be amenable to being updated and revised with increased knowledge, and adapted for regional situations or different wetland types;

* a structuring and testing the results of the project through the creation of the system itself.

Key Questions

* To what extent and how should preliminary workshops be used in initially developing the concepts and information needed to implement the methods?

* Can, and how, might the three approaches be integrated coherently and systematically? Can all be accommodated within a benefit-cost framework?

* In general there is a need to incorporate a more clearly regional/ecosystem/watershed perspective (Zedler, 1988; Phillips, 1989). How might this be undertaken?

* Can, and should, the development of an expert system in addition to the production of a manual be investigated?

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